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High-resolution seismic reflection profiling: an aid for resolving the Pleistocene stratigraphy of a buried valley in central Illinois, USA

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Source: Annals of Glaciology (/content/igsoc/agl), Volume 54, Number 64, September 2013, pp. 10-20(11)

Publisher: International Glaciological Society (/content/igsoc)

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Abstract:

High-resolution seismic reflection (HRSR) data acquired over the Pesotum Bedrock Valley in central Illinois, USA, helped construct the seismic stratigraphy of a valley fill and the overlying sediments. Integrating these data with drilling and borehole geophysics allowed us to develop a seismo-stratigraphic classification for sediments on undulating and folded bedrock. Seven seismo-stratigraphic units that overlie the bedrock surface were characterized. Seismic units A and B include glacial sediments of multiple Pleistocene glaciations above the Pesotum Bedrock Valley, which completely mask the feature. Seismic units C-F, the valley fill, primarily include tills and glacial lake sediment deposited during the earliest Pleistocene glaciations and preglacial alluvium and colluvium that is draped over in situ weathered bedrock. The preservation of conformable-lying glacial and preglacial deposits and paucity of sand and gravel in the buried valley strongly indicate that little or no incision by glacial meltwaters has occurred. These observations contrast markedly with interpretations from buried valleys elsewhere in North America and northern Europe where valley fills contain significant deposits of sand and gravel in tunnel valleys. The HRSR data assisted the characterization and analysis of heterogeneous sedimentary sequences over a buried valley where existing subsurface information was limited. The extent of Pleistocene-age glacial lakes is inferred from the lateral continuity of silt and clay units.

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Document Type: Research Article

DOI: <http://dx.doi.org/10.3189/2013AoG64A602> (<http://dx.doi.org/10.3189/2013AoG64A602>)

Publication date: September 1, 2013

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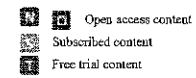
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